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REMARKS

The Final Office Action mailed on February 27, 2002, has been received and reviewed. Claims 33-37 and 41-56 are currently pending in the above-referenced application. Each of claims 33-37 and 41-56 stands rejected.

Reconsideration of the above-referenced application is respectfully requested.

Rejections Under 35 U.S.C. § 103(a)

Claims 33-37 and 41-56 stand rejected under 35 U.S.C. § 103(a) as being unpatentable over U.S. Patent 5,672,542 to Schwiebert et al. (hereinafter "Schwiebert").

M.P.E.P. 706.02(j) sets forth the standard for a Section 103(a) rejection:

To establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success must both be found in the prior art, and not based on applicant's disclosure. *In re Vaeck*, 947 F.2d 488, 20 USPQ2d 1438 (Fed. Cir. 1991).

Schwiebert teaches a reusable, metallic solder mask that may be aligned over a substrate. As shown in FIG. 5 of Schwiebert, apertures 330 of such a solder mask 544 are aligned over wettable regions 322, such as bond pads or terminals, on a surface 321 of a substrate 546. *See also*, col. 7, lines 38-49. Once the solder mask 544 has been used to form solder bumps on the wettable regions 322 of the substrate, the solder mask 544 is removed from the substrate. Col. 10, lines 34-44.

Schwiebert also teaches another solder mask that may be formed from a polymer, such as a photoimageable polyimide, a dry film photomask, or a liquid photoimageable photomask. Col. 6, lines 28-31. One of ordinary skill in the art would readily recognize that a solder mask formed from these photoimageable polymers would be formed *on the surface* of a substrate by

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applying a film of unconsolidated (e.g., liquid or powder) photoimageable polymer to the surface of the substrate, then curing selected regions of the film of unconsolidated photoimageable polymer.

Schwiebert does not include any description, teaching, or suggestion that the polymer solder masks described therein may preformed or assembled with a substrate in the manner depicted in FIG. 5 of Schwiebert. Rather, the description of preformed solder masks in Schwiebert is limited to metallic solder masks, as is evident from the teaching that "magnets 548 . . . hold the mask from below through magnetic attraction . . ." Col. 7, lines 39-41.

Further, Schwiebert does not include any description, teaching, or suggestion that the bumps formed by the masks described therein include apertures that are configured to define peripheral shapes of the conductive bumps. Rather, Schwiebert explains that the "mask aperture . . . dimensions are generally (but are not required to be) somewhat larger than the dimensions of the wettable region" exposed therethrough. Col. 7, lines 50-56. Assuming, *arguendo*, that the solder masks taught in Schwiebert do include apertures that are configured to define peripheral shapes of conductive bumps or other conductive structures, such apertures would not extend beyond the peripheries of the wettable regions exposed therethrough, as the resulting conductive bumps or other conductive structures would extend over and undesirably contact surrounding regions of the substrate of which the wettable regions are a part. Instead, Schwiebert provides, "[u]pon reflow, the solder becomes spherical . . ." Col. 7, lines 56-57.

In view of the teachings of Schwiebert, it is respectfully submitted that there are several reasons that a *prima facie* case of obviousness based on Schwiebert cannot be established against any of claims 33-37 or 41-56.

Schwiebert Does Not Teach or Suggest Each and Every Claim Element

First, it is respectfully submitted that Schwiebert does not teach or suggest each and every element of any of claims 33-37 or 41-56.

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Independent claim 33 recites a *pre-formed solder mask* that includes, among other things, a film of solder mask material *that comprises a polymer* and at least one aperture formed therethrough. The fact that the solder mask of independent claim 33 is pre-formed is emphasized by the recitation that the solder mask is "*to be disposed*" (emphasis supplied) on a substrate. The at least one aperture is "configured to define a peripheral shape of a conductive structure to be formed . . ." therein.

In contrasting the teachings of Schwiebert with the subject matter recited in independent claim 33, it is quite clear that Schwiebert lacks any teaching or suggestion of a pre-formed solder mask that includes a polymer. While the solder mask recited in independent claim 33 may exist separately from a substrate, Schwiebert is devoid of any teaching or suggestion of a polymeric solder mask that may exist independently of a substrate with which the polymeric solder mask is to be used.

Moreover, there is no teaching or suggestion in Schwiebert that the solder mask described therein includes at least one aperture "configured to define a peripheral shape of a conductive structure to be formed . . ." therein. Rather, the teachings of Schwiebert are limited to solder masks with apertures that are sized and configured to permit molten solder, presumably due to the surface tension thereof, to become spherical. Col. 7, lines 55-56.

Accordingly, it is respectfully submitted that Schwiebert does not teach or suggest each and every element of independent claim 33, as is required to maintain a rejection under 35 U.S.C. § 103(a).

Each of claims 34-37, 41, and 42 is allowable, among other reasons, as depending from claim 33, which is allowable.

Independent claim 43 also recites a *pre-formed solder mask* that comprises a film of solder mask material *that comprises a polymer*. The fact that the solder mask of independent claim 43 is pre-formed is emphasized by the recitation that the solder mask is "*to be disposed*" (emphasis supplied) on a substrate. In addition, independent claim 43 recites that the film of

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non-metallic solder mask material includes "a surface configured to be adhered to a substrate . . ." The solder mask of independent claim 43 also includes at least one aperture that is "configured to define a peripheral shape of a conductive structure to be formed . . ." therein.

As explained previously herein, Schwiebert clearly lacks any teaching or suggestion of a *pre-formed* solder mask that comprises a polymer. Further, Schwiebert does not teach or suggest that a solder mask may comprise a film of solder mask material that comprises a polymer and which includes a surface "configured to be adhered to a substrate . . ." Rather, as is clear from fact that all of the polymers that are described in Schwiebert as being useful for forming solder masks are photoimageable polymers, Schwiebert suggests that a solder mask comprising a polymer would have to be formed on the surface of the substrate, rather than pre-formed, then adhered to the substrate.

Moreover, there is no teaching or suggestion in Schwiebert that the solder mask described therein includes at least one aperture "configured to define a peripheral shape of a conductive structure to be formed . . ." therein. Again, Schwiebert merely teaches solder masks with apertures that are configured to permit molten solder to assume a spherical shape. See col. 7, lines 55-56.

Accordingly, it is respectfully submitted that Schwiebert does not teach or suggest each and every element of independent claim 43. It is, therefore, respectfully submitted that, under 35 U.S.C. § 103(a), independent claim 43 is allowable over Schwiebert.

Each of claims 44-48 is allowable, among other reasons, as depending from claim 43, which is allowable.

The semiconductor device assembly recited in independent claim 49 includes, among other things, a substrate, a pre-formed film of solder mask material comprising a polymer on the substrate, and at least one open aperture formed through the pre-formed film. The at least one open aperture is located correspondingly to a contact pad of the substrate and is "configured to define a peripheral shape of a conductive structure to be formed therein."

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By way of contrast with independent claim 49, Schwiebert lacks any teaching or suggestion of a *pre-formed* solder mask of a material comprising a polymer.

Also, Schwiebert neither teaches nor suggests that any of the apertures of the solder masks described therein are "configured to define a peripheral shape of a conductive structure to be formed therein."

It is, therefore, respectfully submitted that Schwiebert does not teach or suggest each and every element of independent claim 49 and that, under 35 U.S.C. § 103(a), independent claim 49 is therefore allowable over Schwiebert.

Claims 50-56 are each allowable, among other reasons, as depending from claim 49, which is allowable.

One of Ordinary Skill in the Art Would Not Have Been Motivated to Modify the Teachings of Schwiebert in the Asserted Manner

Second, it is respectfully submitted that one of ordinary skill in the art would not have been motivated by either Schwiebert or the knowledge that was generally available in the art as of the priority date for the above-referenced application to have modified the teachings of Schwiebert in the manner that has been suggested in the outstanding Office Action.

Specifically, Schwiebert's discussion of the use of polymers to form a solder mask is limited to the use of a photoimageable material which would be used to form a solder mask directly on the surface of a substrate would not have motivated one of ordinary skill in the art to use a solder mask material comprising a polymer to pre-form a solder mask that may be subsequently applied to a substrate.

As Schwiebert includes no teaching or suggestion that would have motivated one of ordinary skill in the art to pre-form a solder mask from a solder mask material that comprises a polymer, it is respectfully submitted that any purported motivation to modify the teachings of Schwiebert in the manner that has been suggested could only have been based on the benefit of hindsight provided by the disclosure and claims of the above-referenced application.

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Schwiebert Teaches Away from the Asserted Modification, As Well As from the Claimed Subject Matter

Third, it is respectfully submitted that, by illustrating in FIGs. 3C and 7 and by teaching, at col. 7, lines 56-57, that solder balls formed using the solder masks described in Schwiebert are spherical in shape and do not have peripheries that are configured by the surfaces of the apertures of the solder mask, Schwiebert actually teaches away from the proposed modification thereof. For the same reason, it is respectfully submitted that Schwiebert teaches away from the recitation of "at least one aperture configured to define a peripheral shape of a conductive structure . . .", as recited in independent claims 33, 43, and 49.

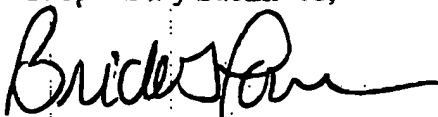
In view of the foregoing, it is respectfully submitted that the Office has not established a *prima facie* case of the obviousness of claims 33 through 37 or 41 through 56 under 35 U.S.C. § 103(a). Accordingly, it is respectfully requested that the Office withdraw the 35 U.S.C. § 103(a) rejections of claims 33 through 37 and 41 through 56 as being unpatentable over Schwiebert.

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CONCLUSION

It is respectfully submitted that each of claims 33-37 and 41-56 is allowable. An early notice of the allowability of each of these claims is respectfully solicited, as is an indication that the above-referenced application has been passed for issuance. If any issues preventing the allowance of any of claims 33-37 or 41-56 remain which might be resolved by way of a telephone conference, the Office is kindly invited to contact the undersigned attorney.

Respectfully Submitted,



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